PROBLEMS AND SOLUTIONS - QUADRATIC FUNCTIONS

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PLEASE NOTE THAT YOU CANNOT ALWAYS USE A CALCULATOR ON THE ACCUPLACER - COLLEGE-LEVEL MATHEMATICS TEST! YOU MUST BE ABLE TO DO SOME PROBLEMS WITHOUT A CALCULATOR!

Problem 1:

Given $g(x) = (x-2)^2 + 1$, do the following:

a. Find the coordinates of the vertex
b. Find the equation of the Axis of Symmetry
c. Find the coordinates of the x-intercept(s)
d. Find the coordinates of the y-intercept(s)
e. Graph the function.

Problem 2:

Given $f(x) = -(x+2)^2 - 1$, do the following:

a. Find the coordinates of the vertex
b. Find the equation of the Axis of Symmetry
c. Find the coordinates of the x-intercept(s)
d. Find the coordinates of the y-intercept(s)
e. Graph the function.

Problem 3:

Given $k(x) = x^2 - 2x + 1$, do the following:

a. Find the coordinates of the vertex
b. Find the equation of the Axis of Symmetry
c. Find the coordinates of the x-intercept(s)
d. Find the coordinates of the y-intercept(s)
e. Graph the function.

Problem 4:

Given $f(x) = x^2$, do the following:

a. Find the coordinates of the vertex
b. Find the equation of the Axis of Symmetry
c. Find the coordinates of the x-intercept(s)
d. Find the coordinates of the y-intercept(s)
e. Graph the function.

Problem 5:

Find an equation for the parabola whose vertex is ***(1, 2)*** and that passes through the point ***(0, 1)***.

Problem 6:

Write the quadratic function $f(x) = -2x^2 + 4x - 8$ in standard form $f(x) = a(x - h)^2 + k$.

Problem 7:

The monthly profit ***P***, in thousands of dollars, of a company can be estimated by the formula $P(x) = -3x^2 + 30x + 12$, where ***x*** is the number of units sold per month. Find the number of units that must be sold by the company to maximize its profit and then find the maximum profit.

Problem 8:

A projectile is shot upward. It's distance above the ground after ***t*** seconds is $s(t) = -16t^2 + 400t$. Please note from physics that any object tossed (fired, thrown, shot) into the air follows a parabolic path back to the ground! Calculate the time it takes for the projectile to hit the ground and find the maximum altitude achieved by the projectile.

Problem 9:

For what values of ***x*** is the graph of $f(x) = x^2 - 4x - 5$ below the x-axis?

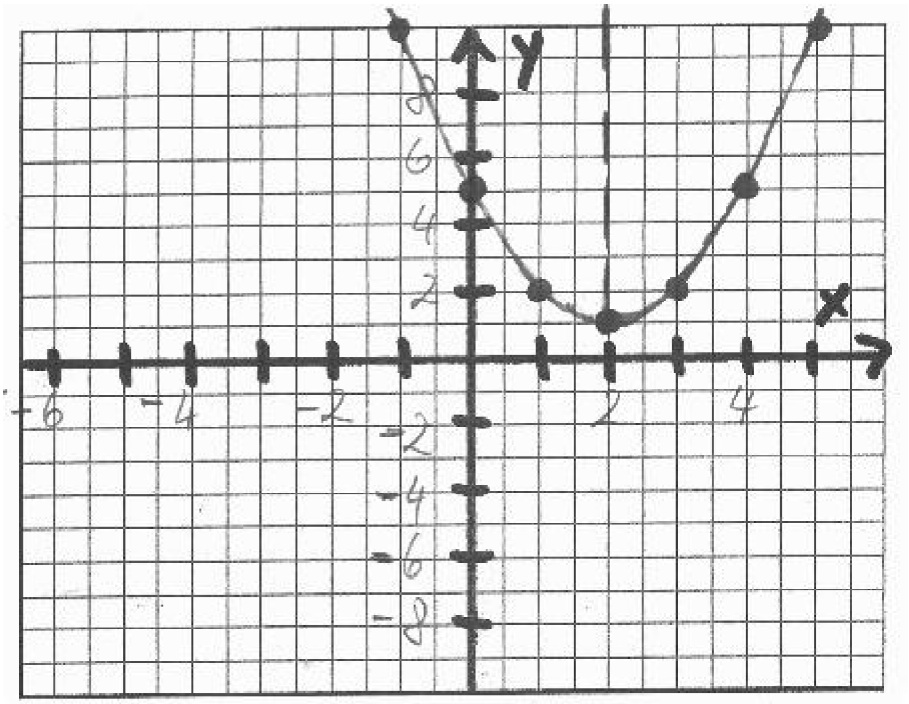
SOLUTIONS

You can find detailed solutions below the link for this problem set!

Problem 1:

- Coordinates of the vertex are ***(2, 1)***.
- Equation of the *Axis of Symmetry:* ***x = 2***
- Coordinates of the x-intercept(s): ***None***
- Coordinates of the y-intercept: ***(0, 5)***
- Graph:

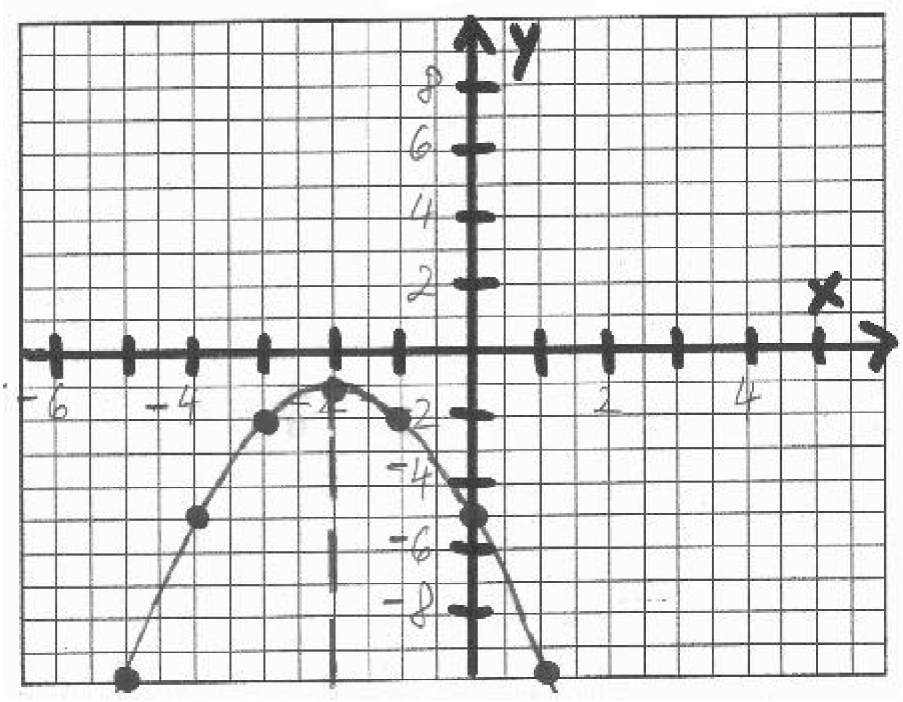
1. **The graph is SMOOTH and the vertex is U-shaped.**
2. **The graph is NEVER parallel to the y-axis. Instead it moves away from it at a steady pace.**



Problem 2:

- Coordinates of the vertex are ***(-2, -1)***.
- Equation of the *Axis of Symmetry:* ***x = -2***
- Coordinates of the x-intercept(s): ***None***
- Coordinates of the y-intercept: ***(0, -5)***
- Graph:

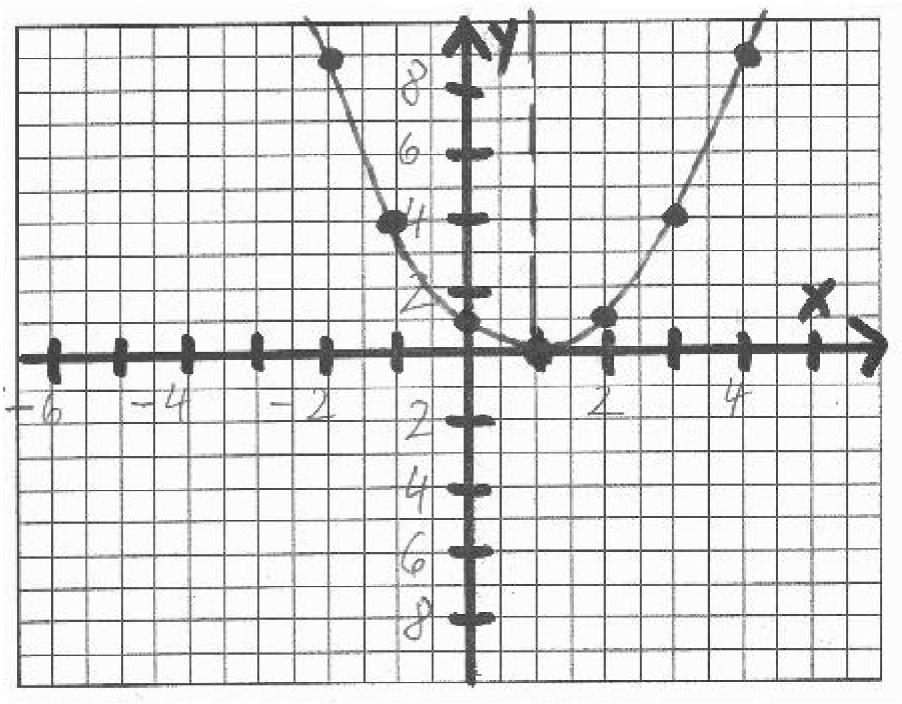
1. **The graph is SMOOTH and the vertex is U-shaped.**
2. **The graph is NEVER parallel to the y-axis. Instead it moves away from it at a steady pace.**

- 

Problem 3:

- Coordinates of the vertex are ***(1, 0)***.
- Equation of the *Axis of Symmetry:* ***x = 1***
- Coordinates of the x-intercept(s): ***(1, 0)***
- Coordinates of the y-intercept: ***(0, 1)***
- Graph:

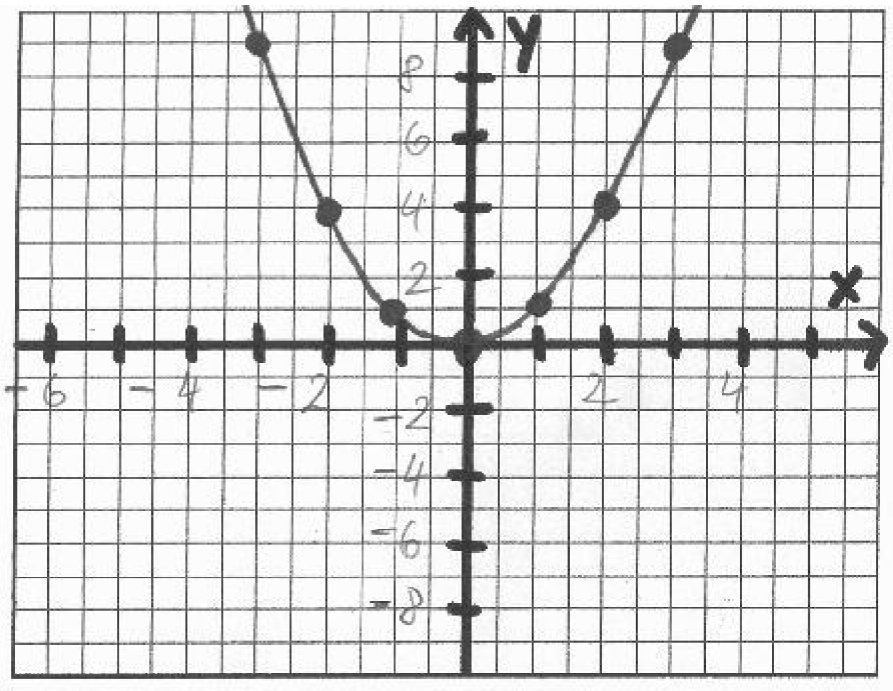
1. **The graph is SMOOTH and the vertex is U-shaped.**
2. **The graph is NEVER parallel to the y-axis. Instead it moves away from it at a steady pace.**



Problem 4:

- Coordinates of the vertex are ***(0, 0)***.
- Equation of the *Axis of Symmetry:* ***x = 0***
- Coordinates of the x-intercept(s): ***(0, 0)***
- Coordinates of the y-intercept: ***(0, 0)***
- Graph:

1. **The graph is SMOOTH and the vertex is U-shaped.**
2. **The graph is NEVER parallel to the y-axis. Instead it moves away from it at a steady pace.**



Problem 5:

$$f(x) = -(x-1)^2 + 2 = -x^2 + 2x + 1$$

Problem 6:

$$f(x) = -2(x-1)^2 - 6$$

Problem 7:

The maximum profit occurs when 5 units are sold.

The maximum profit is $87,000 since the formula expresses the profit in thousands of dollars.

Problem 8:

Time it takes for the projectile to hit the ground: 25 seconds

Maximum Altitude: 2,500 feet

Problem 9:

The graph of $f(x) = x^2 - 4x - 5$ lies below the x-axis between $x = -1$ and $x = 5$.

Let's look at its graph!